

Atty. Docket No. 393551

## REMARKS/ARGUMENTS

These remarks attend to all outstanding issues in the pending office action of March 14, 2005. Claims 1 - 21 remain pending in this application. Claims 1, 18 and 20 are currently amended.

### 1. Claim Objections

Claims 1-17 and 19-21 stand objected to because the term "and less than 300 KHz" recited in claim 1, line 9, lacks antecedent basis in the specification. The specification has been amended at page 10, line 16 to include the specified frequency range. PCT/US00/05665 was incorporated by reference into the present specification at the time of filing; therefore, no new matter has been added by inclusion of this amendment as supported in the international application on page 15, line 4 (previously submitted as Exhibit A). A further amendment to the specification is made for clarity; no new matter is added.

### 2, 3 and 4. Claim Rejections – 35 USC § 102

Claims 1 and 14 stand rejected under 35 USC §102(b) as being anticipated by US Patent No. 5,172,024 to Broussoux et al (hereinafter, "Broussoux"). We respectfully disagree. Among other elements, Broussoux fails to disclose, "an AC power source for providing an AC voltage...having a frequency greater than 1000 Hz and less than 300 KHz." Instead, Broussoux discloses a "...flexible material...may be excited in longitudinal vibration mode at frequencies ranging from 100 Hz to 20 kHz..." (col. 8, lines 29-31, emphasis added). The present application relates to the frequency of an electromagnetic wave, whereas Broussoux relates to the frequency of a mechanical/acoustic vibration in a solid object. Broussoux specifically claims, for example, "a piezoelectric material having a vibrating active surface that mechanically vibrates to eliminate ice on said wall" (claim 1, emphasis added). Furthermore, the frequency of Broussoux's mechanical vibration is not the same as the frequency of the AC voltage used to excite the piezoelectric material as discussed in detail at column 4, lines 34 - 47. Applicant respectfully believes that the Examiner has misinterpreted Broussoux's frequency range.

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Also regarding claim 1, the Examiner has stated that "the term 'for melting interfacial ice' is considered [an] intended use". Applicant understands this comment to mean that the Examiner regards the phrase "for melting interfacial ice" as part of the preamble that does not breathe life and meaning into the claim. In light of this interpretation, the body of claim 1 has been amended to clarify that "the interfacial ice is melted upon application of the AC voltage".

Broussoux teaches a mechanical device to eliminate ice comprising "a piezoelectric material having a **vibrating active surface that mechanically cooperates with the wall to be de-iced...the amplitude of this vibration being sufficient to respectively detach and/or break the deposit of ice formed on said surface**" (col. 2, lines 47-60, emphasis added). Broussoux further specifies "...a system **using no longer the Joule effect but the mechanical vibrations produced by acoustic transmitters...**" (col. 8, lines 11-12, emphasis added). Broussoux does not however anticipate a system "wherein the interfacial ice is melted upon application of the AC voltage" as in Applicant's amended claim 1. As claim 14 depends from claim 1, and therefore also incorporates a system wherein interfacial ice is melted upon application of an AC voltage, Broussoux also fails to teach every element of claim 14.

In view of the above remarks, Applicant contends that claims 1 and 14 are allowable, and respectfully requests the Examiner's reconsideration.

Claim 18 stands rejected as being anticipated by US Patent No. 6,825,444 to Tuan et al (hereinafter, "Tuan"). Tuan discloses a composition for and method of making conductive concrete, which may be embedded with electrodes such that an applied voltage will resistively heat a conductive concrete slab (and, by conduction, any ice thereon). Claim 18 is amended herein to recite the step of "providing a second electrode wherein an interelectrode distance that separates the first electrode and the second electrode has a value in a range of about from 50  $\mu$ m to 500  $\mu$ m." Support for this amendment may be found, for example, at page 4, lines 1-4; page 9, lines 6-8; and claims 7-9. Applicant believes that amended claim 18 is allowable over Tuan which states: "The electrodes 24,26 within each concrete slab 22 preferably are spaced four to six feet apart" (col. 7, lines 16-18). Tuan fails to disclose every element of Applicant's amended claim 18 and, thus, fails to anticipate claim 18. Applicant

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respectfully requests withdraw of the Examiner's rejection and further requests allowance of claim 18.

### 5 - 13. Claim Rejections – 35 USC § 103

Claim 1 stands rejected under 35 USC §103(a) as being unpatentable over Tuan in view of Broussoux. Applicant respectfully disagrees and traverses the rejection.

The following is a quotation of from the MPEP setting forth the three basic criteria that must be met to establish a *prima facie* case of obviousness:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP §2142, citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Broussoux and Tuan, alone or in combination, fail to teach every element of claim 1. As discussed above, Broussoux discloses a frequency range for mechanical vibrations; but it fails to disclose specified frequencies of claim 1. For at least this reason, the combination of Broussoux and Tuan fails to render claim 1, or any other claim in the instant application, *prima facie* obvious.

There is also no motivation to combine Broussoux and Tuan. Broussoux and Tuan teach completely different methods of addressing two completely different problems related to surface ice. Broussoux uses radio waves to generate mechanical vibrations in a solid object and physically break ice from a surface, whereas Tuan uses electricity to generate Joule heat in a conductive concrete surface. According to Tuan, ice is melted by conductive heat transfer from a resistively heated concrete slab. Given the very different modes of operation (breaking versus melting), there is no

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motivation to combine Tuan and Broussoux. Additionally, Broussoux is concerned with the removal of ice from a window that protects radar equipment. Obviously, a conductive concrete slab (Tuan) could not be used for this purpose. Nor would it seem prudent to use mechanical vibrations (Broussoux), which may exacerbate structural defects or lead to resonance, to break ice formed on a bridge surface (Tuan).

There is no reasonable expectation of successfully creating the ice removal system of the present application by combining Tuan's heating system with Broussoux's mechanical system. The present application discloses a system wherein an AC voltage is generated in interfacial ice (*e.g.*, claim 18). In contrast, Tuan teaches that an AC voltage is generated in conductive concrete. Thus, in the instant application, ice acts as an electrical conductor whereas, in Tuan's invention, concrete acts as an electrical conductor and ice becomes heated mainly through conduction. Tuan's interelectrode distance is about 4-6 feet (col. 7, lines 16-18), which is very different from the interelectrode distance of about 50  $\mu\text{m}$  to 500  $\mu\text{m}$  specified in the present application.

The combination of Tuan and Broussoux fails, on all counts, to render claim 1 or any other claims of the present application. Applicant contends that claim 1 is allowable, and respectfully requests the Examiner's reconsideration.

Claim 2 stands rejected under 35 USC §103(a) as being unpatentable over Broussoux in view of U.S. Patent No. 4,895,322 to Zieve (hereinafter, "Zieve"). Applicant respectfully disagrees and traverses the rejection. Applicant believes that Broussoux and Zieve do not render any of the claims *prima facie* obvious, as explained below.

Applicant's claim 2 depends from claim 1, argued above. Broussoux does not teach the elements of claim 1. As elaborated above, Broussoux teaches detaching or breaking ice by applying to a material "an AC voltage...so as to stress the material and break the film of ice...formed on the surface of this material"(col. 6, lines 53-56). Again, Broussoux employs "...a system using no longer the Joule effect but the mechanical vibrations produced by acoustic transmitters..."(col. 8, lines 11-12). Broussoux teaches neither the AC voltage frequency range recited in claim 1 nor "the interfacial ice is melted upon application of an AC voltage".

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Zieve is cited, presumably, because it discloses an AC power source providing an AC voltage of about 10 volts to 500 volts. However, nowhere does Zieve teach a system for melting interfacial ice. Rather, Zieve teaches a mechanical system, wherein "The current through the coil creates a magnetic field and establishes eddy currents in the thin metal skin of the aircraft wing. The repulsive force created between the coil and the wing...produces a rapid acceleration of the wing surface...This results in the ice which has been formed on the wing **debonding from the wing surface and shattering away from the wing**"(col. 3, line 64 - col. 4, line 6, emphasis added). Neither Zieve nor Broussoux, either alone or in combination, teach or suggest every element of Applicant's claim 1. As claim 2 depends from claim 1, neither do Broussoux or Zieve teach or suggest every element of Applicant's claim 2.

Given the remarks above, Applicant respectfully requests withdrawal of the Examiner's rejection, and further requests allowance of claim 2.

Claims 3, 6, 12-13, 15 and 16 further stand rejected under 35 USC §103(a) as being unpatentable over Broussoux in view of US Patent No. 4,732,351 to Bird (hereinafter, "Bird"). Applicant respectfully disagrees and traverses the rejection. As argued above, Broussoux does not teach or suggest every element of Applicant's claim 1. Claims 3, 6, 12-13, 15 and 16 depend from claim 1. Bird also fails to teach or suggest every element of Applicant's claim 1. Bird teaches a mechanical device utilizing a piezoelectric material "which converts available electrical alternating current into mechanical force by realignment of its crystalline structures. This realignment **causes the material to expand and retract in continuous motion and, thereby, prevents ice formation**"(col. 4, lines 10-14, emphasis added). Bird discloses nothing of a system for melting interfacial ice; indeed, Bird specifies that the device "does not have to raise the temperature of the surface to the melting point of ice"(col. 3, lines 65-67). Therefore, as stated above, Broussoux and Bird, alone or in combination, do not teach or suggest every element of Applicant's claim 1 or (because they depend from claim 1) claims 3, 6, 12-13, 15 or 16. Applicant therefore requests withdrawal of the Examiner's rejection, and further requests allowance of claims 3, 6, 12-13, 15 and 16.

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Claims 7-9 stand rejected under USC §103(a) as being unpatentable over Broussoux in view of U.S. Patent No. 6,239,601 to Weinstein (hereinafter, "Weinstein"). Again, Broussoux neither teaches nor suggests the elements of Applicant's claim 1. Claims 7-9 depend from claim 1. Applicant respectfully disagrees with the Examiner's rejection for at least the following reasons:

The Examiner cites Weinstein, stating that Weinstein discloses an interelectrode distance having a value of about 50  $\mu\text{m}$  to about 500  $\mu\text{m}$ . However, Weinstein teaches a "thickness measurement device and method that determines the thickness of a layer of ice" (col. 1, lines 55-56). Nowhere does Weinstein teach or suggest Applicant's claim 1. As claims 7-9 depend from claim 1, Applicant submits neither Broussoux nor Weinstein, alone or in combination, teach or suggest all of the elements of Applicant's claims 7-9.

In view of the above arguments, Applicant respectfully requests withdrawal of the Examiner's objection, and further requests allowance of claims 7-9.

Claims 19-20 stand rejected under USC §103(a) as being unpatentable over Tuan in view of Broussoux. The Examiner submits that Tuan discloses substantially all features of the claimed invention except the step of applying an alternating electric field having a frequency greater than 1000Hz. As laid out above, respectfully, the frequencies disclosed by Broussoux at col. 8, lines 30-31 have been misinterpreted. They represent mechanical vibration frequencies rather than AC voltage frequencies. Additionally, claim 18 has been amended to specify an interelectrode distance, which neither Tuan nor Broussoux disclose. For at least these reasons, neither Tuan nor Broussoux, alone or in any combination, teach or suggest every element of Applicant's claim 18, or its dependent claims 19-20.

Claim 20 has been amended to reflect changes made to independent base claim 18. No new matter has been added by these amendments.

In light of the above remarks, withdrawal of the Examiner's rejection, and allowance of claims 19-20 is requested.

Claim 21 stands rejected under USC §103(a) as being unpatentable over Tuan in view of Broussoux and further in view of Zieve. Respectfully, Applicant disagrees and traverses the rejection. Neither Tuan nor Broussoux nor Zieve teach or suggest

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"an interelectrode distance that separates the first electrode and the second electrode has a value in a range of about from 50  $\mu\text{m}$  to 500  $\mu\text{m}$ " as in Applicant's amended claim 18. Claim 21 depends from claim 18. Tuan discloses an interelectrode distance of about 4-6 feet; Broussoux discloses an interelectrode dimension of about 0.001 m (col. 6, line 67-68); and Zieve shows openings 130,132 where the electrodes are press fitted into the backing plate which is 3/16 inches high (col. 8, lines 26-48; FIG. 13). Given these arguments, along with those regarding Tuan, Broussoux and Zieve elaborated in further detail above, Applicant respectfully requests withdrawal of the Examiner's rejection, and further requests allowance of claim 21.

#### Allowable Subject Matter

Applicant thanks the Examiner for recognizing the allowable subject matter recited in claims 4, 10-11 and 17. Applicant submits that there are further reasons for allowance of these and all other claims not specifically referenced in the Office Action of March 14, 2005, or in the remarks contained herein.

In view of the above Remarks, Applicant has addressed all issues raised in the Office Action dated March 14, 2005, and respectfully solicits a Notice of Allowance. Should any issues remain, the Examiner is encouraged to telephone the undersigned attorney.

Applicant believes no fees are currently due, however, if any fee is deemed necessary in connection with this Response, please charge Deposit Account No. 12-0600.

Respectfully submitted,

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